Pre-pregnancy adherence to dietary recommendations for the prevention of cardiovascular disease in relation to risk of hypertensive disorders of pregnancy

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ON-LINE SUPPLEMENTARY MATERIAL

Supplementary Table 1. Differences in demographic and reproductive characteristics by comparing women from our analytic sample with the source population across responders and non-responders.

Supplementary Table 2. Pre-pregnancy AHA and DASH dietary pattern scores and the risk of HDP: preeclampsia (n=495) or GHTN (n=561).

Supplementary Table 3. Pre-pregnancy AHA and DASH dietary pattern scores and the risk of preeclampsia across subgroups of women.

Supplementary Table 4. Pre-pregnancy AHA and DASH dietary pattern scores within strata of risk factors for preeclampsia

Supplementary Table 5. Pre-pregnancy AHA and DASH dietary pattern scores with the risk of HDP phenotypes considering weight changes between pregnancies among women that contributed at least 2 pregnancies to the study (N=14,307 pregnancies)

Supplementary Figure 1. Participant eligibility flowchart. The Nurses' Health Study – II (1991 – 2009)

Supplementary Figure 2. Association of pre-pregnancy intakes of individual AHA and DASH score components with the risk of all phenotypes of hypertensive disorders of pregnancy (HDPs). The Nurses' Health Study II (1991 – 2009). N= 11,535 women, 16,896 pregnancies.

Supplementary Figure 3. Intakes from the individual components of the AHA and DASH dietary pattern scores and the risk of preeclampsia.

SUPPLEMENTARY TABLE 1. Differences in demographic and reproductive characteristics by comparing women from our analytic sample with the source population across responders and non-responders.[1]

Baseline participant characteristics (1991)[2]	All responders in 1991	Responders in 1991 and 2009	Responders in 1991 non-responders 2009	Analytic sample 1991
Number of women	108,206	87,066	21,140	11,535
Age, (IQR)	36 (33,40)	36 (33,40)	36 (32,39)	35 (32,38)
BMI3, (IQR)	23.3 (21.0,26.6)	23.1 (21.0,26.6)	23.7 (21.3,27.5)	22.7 (20.9)
White, (%)	92	93	89	94
AHA primary score[3], (IQR)	30 (24,36)	30 (24,36)	29 (23,35)	30 (24,36)
AHA secondary score[1], (IQR)	47 (39,55)	47 (39,55)	46 (38,54)	47 (39, 55)
DASH score[3], (IQR)	24 (20,27)	24 (20,27)	23 (19,27)	24 (21,28)
History of preeclampsia, (%)	9	9	10	5
Risk of preeclampsia, (% of pregnancies 1992-2009)	2.5	2.3		2.9
Parity, (%)				
Nulliparous	26	25	28	35
Parous	72	73	70	62
Missing	2	2	3	3

[1]Abbreviations: AHA, American Heart Association diet recommendations; DASH, Dietary Approaches to Stop Hypertension; IQR, interquartile range.
[2]Values are presented as median (IQR) for continuous variables and as percentages for categorical variables.
[3]These variables have missing values.

SUPPLEMENTARY TABLE 2. Pre-pregnancy AHA and DASH dietary pattern scores and the risk of HDP: preeclampsia (n=495) or GHTN (n=561).[1]

	Unadjusted Relative Risk[2] (95%CI)		
Unadjusted models	**AHA primary**	**AHA secondary**	**DASH**
HDP (n=1,056)			
Q1	1.00	1.00	1.00
Q2	1.06 (0.89, 1.26)	0.89 (0.75, 1.07)	0.97 (0.81, 1.17)
Q3	0.89 (0.74, 1.08)	0.98 (0.82, 1.17)	0.91 (0.76, 1.08)
Q4	1.04 (0.87, 1.24)	0.84 (0.70, 1.00)	0.79(0.65, 0.95)
Q5	0.82 (0.68, 1.00)	0.81 (0.67, 0.97)	0.74 (0.61, 0.89)
P-trend	0.09	0.02	0.0001
Preeclampsia (n=495)			
Q1	1.00	1.00	1.00
Q2	0.91 (0.71, 1.18)	0.81 (0.62, 1.06)	0.77 (0.60, 1.00)
Q3	0.74 (0.56, 0.98)	0.87 (0.67, 1.13)	0.70 (0.54, 0.91)
Q4	0.96 (0.74, 1.23)	0.83 (0.64, 1.08)	0.67 (0.51, 0.88)
Q5	0.72 (0.55, 0.96)	0.80 (0.61, 1.05)	0.56 (0.42, 0.74)
P-trend	0.07	0.14	<.0001
GHTN (n=561)			
Q1	1.00	1.00	1.00
Q2	1.22 (0.95, 1.57)	0.97 (0.76, 1.25)	1.23 (0.95, 1.60)
Q3	1.06 (0.81, 1.38)	1.09 (0.85, 1.39)	1.17 (0.90, 1.51)
Q4	1.13 (0.88, 1.45)	0.84 (0.65, 1.09)	0.93 (0.71, 1.23)
Q5	0.93 (0.71, 1.22)	0.82 (0.62, 1.07)	0.96 (0.73, 1.27)
P-trend	0.57	0.08	0.20

[1]Abbreviations: AHA, American Heart Association diet recommendations; DASH, Dietary Approaches to Stop Hypertension; Q, quintile of score adherence.

[2]Models were ran by log-binomial generalized regression models with exchangeable correlation and generalized estimating equations to account for repeated pregnancies from the same woman which included terms for dietary patterns score adherence quintiles.

SUPPLEMENTARY TABLE 3. Pre-pregnancy AHA and DASH dietary pattern scores and the risk of preeclampsia across subgroups of women.[1]

	Adjusted[2] RR (95%CI) of preeclampsia by quintiles of score adherence					
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**P-trend**
All participants (n = 16,892)						
AHA 1^0	1.00	0.92 (0.71, 1.19)	0.75 (0.56, 0.99)	0.98 (0.76, 1.26)	0.74 (0.55, 1.00)	0.13
AHA 2^0	1.00	0.69 (0.52, 0.90)	0.81 (0.62, 1.04)	0.74 (0.57, 0.98)	0.81 (0.61, 1.07)	0.20
DASH	1.00	0.83 (0.64, 1.08)	0.74 (0.57, 0.96)	0.76 (0.57, 1.00)	0.65 (0.48, 0.87)	0.01
Comparison group is normotensive (n = 16,331)						
AHA 1^0	1.00	0.93 (0.72, 1.20)	0.75 (0.57, 0.99)	0.99 (0.77, 1.27)	0.75 (0.56, 1.01)	0.15
AHA 2^0	1.00	0.69 (0.52, 0.90)	0.81 (0.62, 1.04)	0.75 (0.57, 0.98)	0.80 (0.61, 1.06)	0.19
DASH	1.00	0.85 (0.65, 1.10)	0.74 (0.57, 0.97)	0.76 (0.57, 1.00)	0.65 (0.48, 0.88)	0.01
First eligible pregnancy (n = 11,535)[3]						
AHA 1^0	1.00	0.91 (0.69, 1.21)	0.75 (0.55, 1.02)	1.05 (0.80, 1.38)	0.83 (0.60, 1.14)	0.58
AHA 2^0	1.00	0.67 (0.50, 0.91)	0.76 (0.57, 1.01)	0.82 (0.61, 1.09)	0.83 (0.61, 1.12)	0.45
DASH	1.00	0.80 (0.60, 1.06)	0.73 (0.55, 0.98)	0.85 (0.63, 1.14)	0.70 (0.50, 0.97)	0.07
No history of preeclampsia at baseline (n =16,241)[4]						
AHA 1^0	1.00	0.93 (0.71, 1.21)	0.73 (0.54, 0.99)	0.94 (0.71, 1.24)	0.76 (0.56, 1.03)	0.13
AHA 2^0	1.00	0.76 (0.57, 1.02)	0.85 (0.64, 1.12)	0.76 (0.56, 1.02)	0.83 (0.62, 1.12)	0.25
DASH	1.00	0.83 (0.63, 1.09)	0.73 (0.55, 0.97)	0.70 (0.52, 0.95)	0.63 (0.46, 0.87)	0.003
Pregnancies in the year following FFQ (1992, 1996, 2000, & 2004) (n = 5,649)						
AHA 1^0	1.00	0.81 (0.52, 1.24)	0.71 (0.45, 1.13)	0.73 (0.47, 1.14)	0.57 (0.34, 0.96)	0.03
AHA 2^0	1.00	0.57 (0.36, 0.93)	0.88 (0.58, 1.34)	0.64 (0.40, 1.01)	0.55 (0.33, 0.91)	0.04
DASH	1.00	0.75 (0.49, 1.15)	0.58 (0.37, 0.92)	0.64 (0.40, 1.02)	0.43 (0.25, 0.75)	0.002

[1]Abbreviations: AHA, American Heart Association; AHA 1^0, AHA primary score; AHA 2^0, AHA secondary score; DASH, Dietary Approaches to Stop Hypertension; FFQ, food frequency questionnaire; Q, quintile of score adherence; Q1, lowest quintile of adherence; Q5, highest quintile of adherence.
[2]Models were ran by log-binomial generalized regression models with exchangeable correlation matrix using generalized estimating equation to account for repeated pregnancies from the same woman and adjusted for age at pregnancy, physical activity, smoking status, year of pregnancy, infertility diagnosis, marital status, race, parity multivitamin use, history of gestational diabetes and preeclampsia at baseline.
[3]Excluded n = 561 cases of GHTN
[4]Excluded n = 651 women that reported preeclampsia at baseline.

SUPPLEMENTARY TABLE 4. Pre-pregnancy AHA and DASH dietary pattern scores within strata of risk factors for preeclampsia.[1]

Risk Factors	Cases, n (%)	Number of Pregnancies	Adjusted[2] RR (95%CI) comparing increase from the 10th to 90th percentile[3]		
			AHA Primary	AHA Secondary	DASH
All participants	495 (2.93)	16,892	0.78 (0.61, 1.00)	0.87 (0.69, 1.10)	0.65 (0.51, 0.84)
Age at pregnancy					
< 30 y	44 (4.44)	991	1.19 (0.54, 2.61)	1.34 (0.55, 3.26)	1.06 (0.44, 2.54)
≥ 30 y	451 (2.84)	15,901	0.81 (0.63, 1.05)	0.93 (0.72, 1.19)	0.64 (0.49, 0.83)
P-interaction	-	-	0.36	0.31	0.44
Parity[4]					
Nulliparous	262 (5.87)	4,465	0.92 (0.65, 1.29)	0.94 (0.68, 1.29)	0.73 (0.52, 1.03)
Parous	214 (1.81)	11,838	0.62 (0.43, 0.90)	0.71 (0.49, 1.03)	0.50 (0.34, 0.74)
P-for interaction	-	-	0.90	0.24	0.45
Pre-pregnancy BMI					
< 25 kg/m^2	314 (2.58)	12,156	0.76 (0.56, 1.03)	0.79 (0.59, 1.06)	0.60 (0.44, 0.82)
≥ 25 kg/m^2	181 (3.82)	4,736	0.88 (0.59, 1.33)	1.12 (0.76, 1.66)	0.82 (0.54, 1.24)
P-interaction	-	-	0.23	0.03	0.04
Hypercholesterolemia					
Yes	91 (4.28)	2,127	0.59 (0.33, 1.05)	0.72 (0.41, 1.26)	0.47 (0.25, 0.88)
No	404 (2.74)	14,765	0.84 (0.64, 1.11)	0.92 (0.71, 1.20)	0.71 (0.54, 0.94)
P-interaction	-	-	0.41	0.58	0.24
Smoking[5]					
Never smokers	449 (2.85)	15,744	0.83 (0.64, 1.07)	0.97 (0.76, 1.25)	0.66 (0.50, 0.86)
Past and current smokers	43 (3.86)	1,113	0.62 (0.29, 1.34)	0.60 (0.27, 1.32)	0.55 (0.24, 1.24)
P-interaction	-	-	0.70	0.35	0.27
Gestational age at birth					
< 37 weeks	136 (10.9)	1,250	0.67 (0.44, 1.01)	0.85 (0.56, 1.30)	0.74 (0.46, 1.19)
≥ 37 weeks	359 (2.30)	15,642	0.83 (0.62, 1.12)	0.85 (0.64, 1.13)	0.63 (0.47, 0.85)
P-interaction	-	-	0.36	0.88	0.65

[1]Abbreviations: AHA, The American Heart Association; BMI, body mass index; DASH, Dietary Approaches to Stop Hypertension.

[2]Models were ran by log-binomial generalized regression models with exchangeable correlation matrix using generalized estimating equation to account for repeated pregnancies from the same woman and adjusted for age at pregnancy, physical activity, smoking status, year of pregnancy, infertility diagnosis, marital status, race, parity multivitamin use, history of gestational diabetes and preeclampsia at baseline.

[3]Icreases for the AHA primary score 19 points, AHA secondary score 29 points, and DASH score 13 points.

[4]n = 589 missing.

[5]n = 35 missing

SUPPLEMENTARY TABLE 5. Pre-pregnancy AHA and DASH dietary pattern scores with the risk of HDP phenotypes considering weight changes between pregnancies among women that contributed at least 2 pregnancies to the study (N=14,307 pregnancies).[1]

	Adjusted[2] RR (95%CI)					
AHA Primary	Q1	Q2	Q3	Q4	Q5	P-trend
HDP						
Model 1	1.00	1.07 (0.90, 1.27)	0.90 (0.75, 1.09)	1.07 (0.90, 1.28)	0.86 (0.71, 1.05)	0.27
Model 2	1.00	1.14 (0.94, 1.39)	0.94 (0.76, 1.17)	1.05 (0.86, 1.30)	0.83 (0.66, 1.04)	0.13
Preeclampsia						
Model 1	1.00	0.92 (0.71, 1.19)	0.75 (0.56, 0.99)	0.98 (0.76, 1.26)	0.74 (0.55, 1.00)	0.13
Model 2	1.00	0.94 (0.70, 1.28)	0.70 (0.50, 0.99)	0.91 (0.67, 1.24)	0.64 (0.45, 0.92)	0.03
GHTN						
Model 1	1.00	1.20 (0.94, 1.53)	1.05 (0.81, 1.36)	1.14 (0.88, 1.46)	0.96 (0.73, 1.27)	0.82
Model 2	1.00	1.31 (0.99, 1.74)	1.18 (0.88, 1.59)	1.16 (0.87, 1.56)	1.00 (0.73, 1.38)	0.83
AHA secondary						
HDP						
Model 1	1.00	0.89 (0.75, 1.07)	0.95 (0.80, 1.12)	0.90 (0.74, 1.08)	0.90 (0.74, 1.09)	0.32
Model 2	1.00	1.05 (0.86, 1.29)	1.11 (0.91, 1.36)	0.87 (0.70, 1.08)	0.88 (0.70, 1.11)	0.12
Preeclampsia						
Model 1	1.00	0.69 (0.52, 0.90)	0.81 (0.62, 1.04)	0.74 (0.57, 0.98)	0.81 (0.61, 1.07)	0.20
Model 2	1.00	0.94 (0.68, 1.28)	1.00 (0.73, 1.37)	0.78 (0.56, 1.09)	0.75 (0.52, 1.07)	0.07
GHTN						
Model 1	1.00	1.10 (0.85, 1.41)	1.07 (0.84, 1.38)	1.04 (0.80, 1.35)	0.98 (0.74, 1.30)	0.57
Model 2	1.00	1.14 (0.86, 1.51)	1.17 (0.88, 1.55)	0.93 (0.69, 1.26)	0.98 (0.72, 1.35)	0.60
DASH						
HDP						
Model 1	1.00	1.05 (0.89, 1.26)	0.97 (0.81, 1.16)	0.89 (0.73, 1.08)	0.89 (0.73, 1.09)	0.09
Model 2	1.00	1.01 (0.82, 1.25)	1.01 (0.82, 1.23)	0.86 (0.69, 1.08)	0.85 (0.67, 1.06)	0.06
Preeclampsia						
Model 1	1.00	0.83 (0.64, 1.08)	0.74 (0.57, 0.96)	0.76 (0.57, 1.00)	0.65 (0.48, 0.87)	0.01
Model 2	1.00	0.75 (0.55, 1.03)	0.71 (0.52, 0.96)	0.63 (0.45, 0.88)	0.54 (0.38, 0.76)	0.0004
GHTN						
Model 1	1.00	1.30 (1.01, 1.69)	1.23 (0.95, 1.60)	1.03 (0.78, 1.38)	1.18 (0.88, 1.57)	0.82
Model 2	1.00	1.31 (0.96, 1.78)	1.36 (1.01, 1.83)	1.13 (0.82, 1.56)	1.22 (0.89, 1.69)	0.56

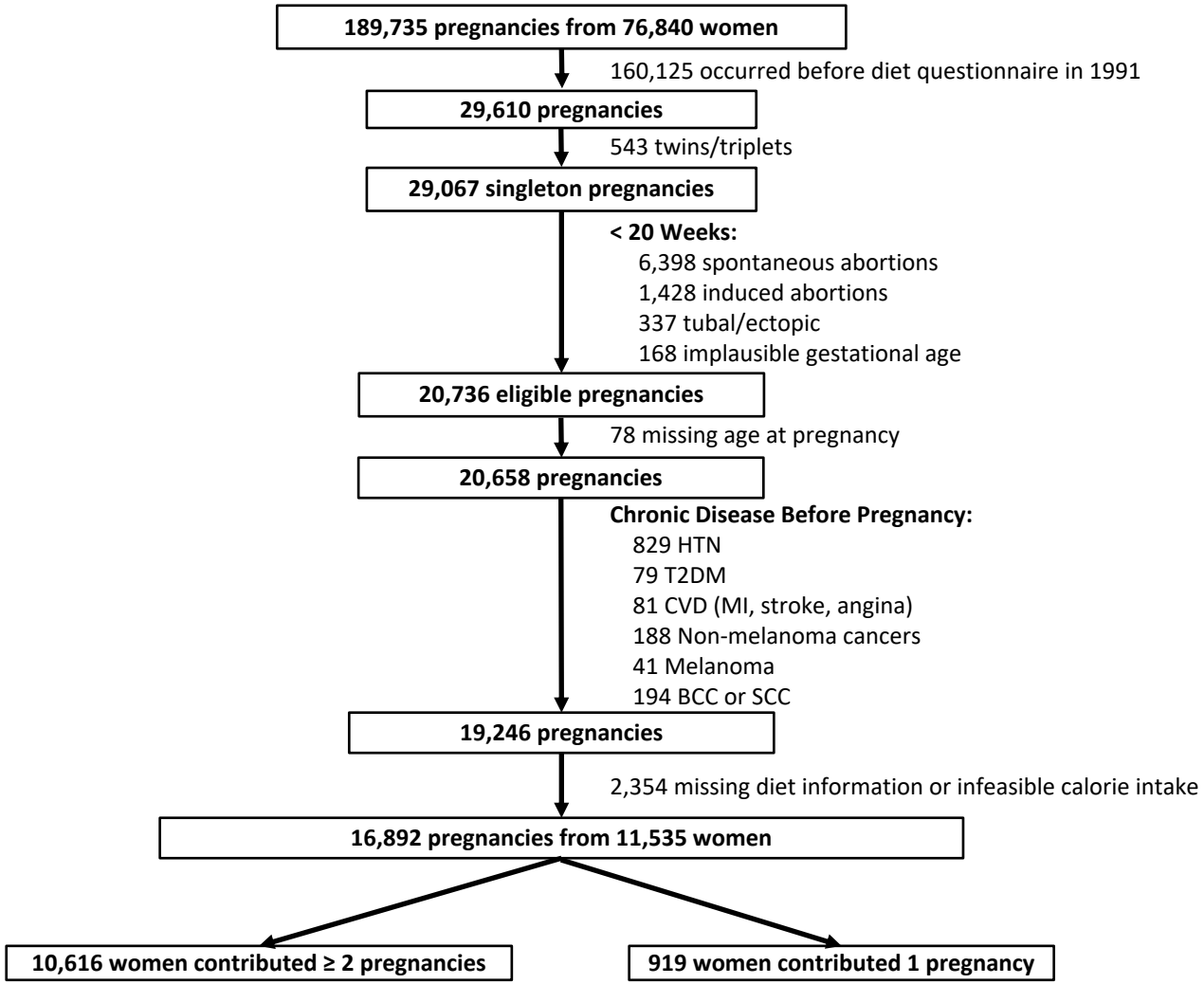
[1]Abbreviations: AHA, The American Heart Association; BMI, body mass index; DASH, Dietary Approaches to Stop Hypertension; GHTN, gestational hypertension.

[2]Models were ran by log-binomial generalized regression models with exchangeable correlation matrix using generalized estimating equation to account for repeated pregnancies from the same woman.

[3]Model 1 was adjusted for age at pregnancy, physical activity, smoking status, year of pregnancy, infertility diagnosis, marital status, race, parity multivitamin use, history of gestational diabetes and preeclampsia at baseline (original results).

[4]Model 2 same as Model 1 and weight change between each pregnancy.

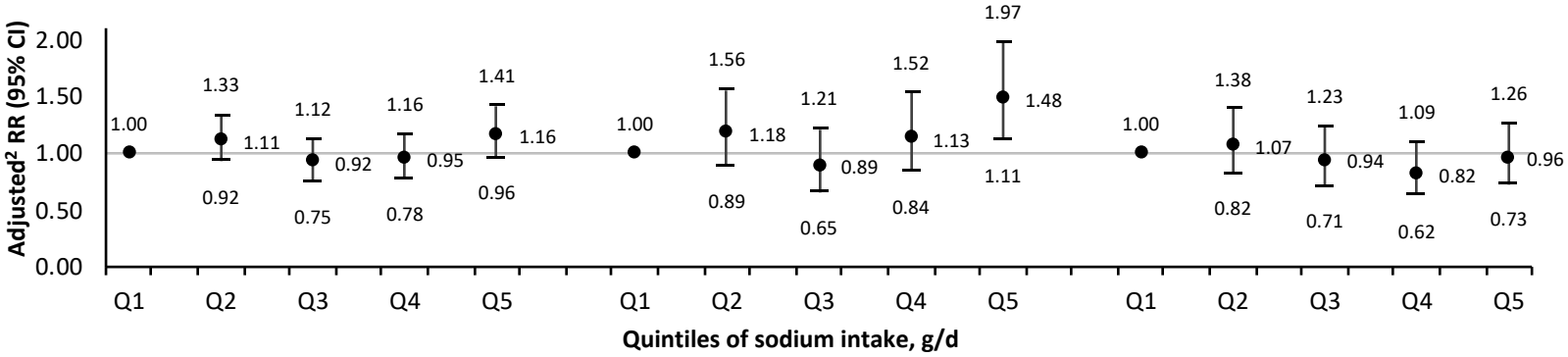
Supplementary Figure 1. Participant eligibility flowchart. The Nurses' Health Study – II (1991 – 2009)[1]



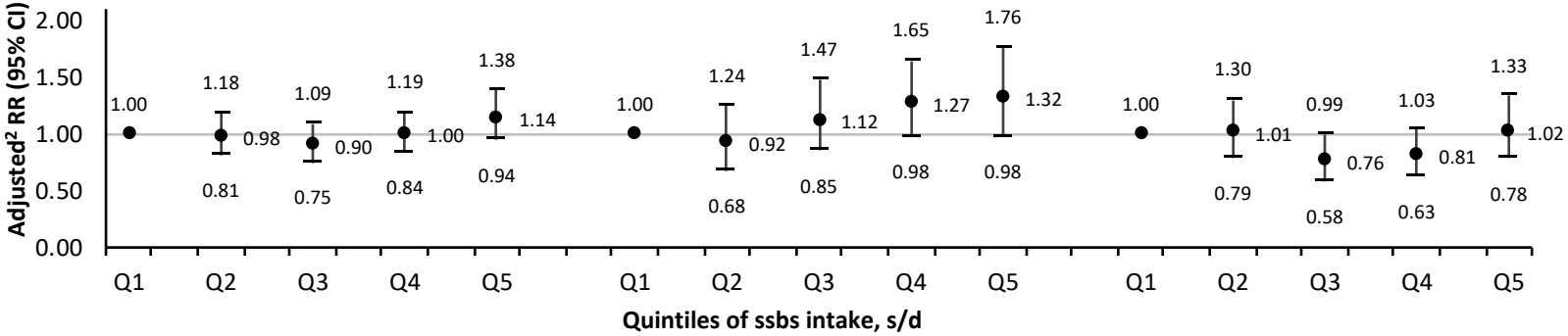
[1]BCC, basal cell carcinoma of the skin; CVD, cardiovascular disease; HTN, hypertension; SCC, squamous cell carcinoma of the skin; T2DM, type 2 diabetes.

Supplementary Figure 2. Association of pre-pregnancy intakes of individual AHA and DASH score components with the risk of all phenotypes of hypertensive disorders of pregnancy (HDPs). The Nurses' Health Study II (1991 – 2009). N= 11,535 women, 16,896 pregnancies.[1]

A. Co-adjusting for individual components of the AHA score



Median intake (range) Q1: 1.64 (0.52 – 1.80) Q2: 1.91 (1.81 – 2.00) Q3: 2.10 (2.00 – 2.18) Q4: 2.27 (2.18 – 2.38) Q5: 2.55 (2.38 – 5.08)



Median intake (range) Q1: 0.00 (0.00 – 0.00) Q2: 0.07 (0.07 – 0.07) Q3: 0.14 (0.14 – 0.21) Q4: 0.43 (0.28 – 0.85) Q5: 1.28 (0.86 – 10.0)

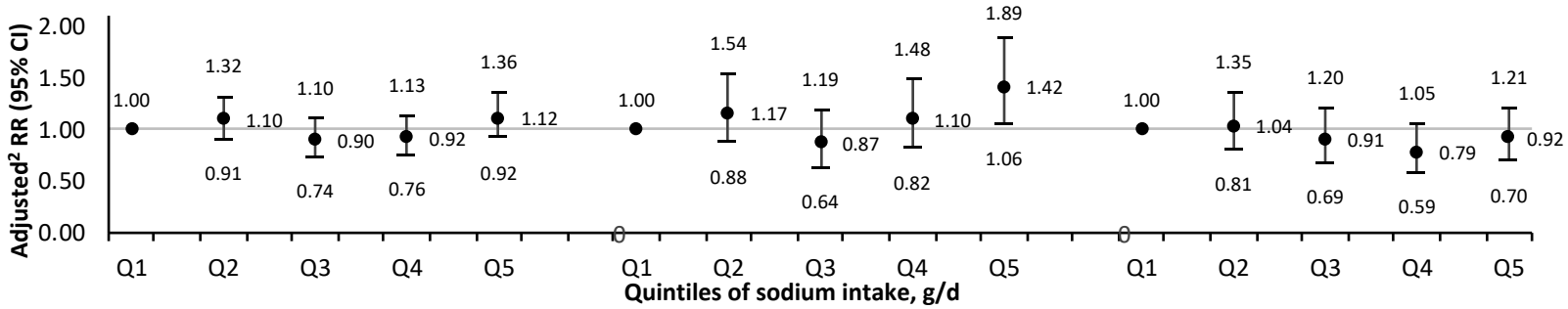
HDP (n=1,056) **Preeclampsia (n=495)** **GHTN (n=561)**

[1]Abbreviations: GHTN, gestational hypertension; RR (95%CI), relative risk 95% confidence intervals; Q1, lowest quintile of intake; Q5, highest quintile of intake; SSBs, sugar-sweetened beverages.

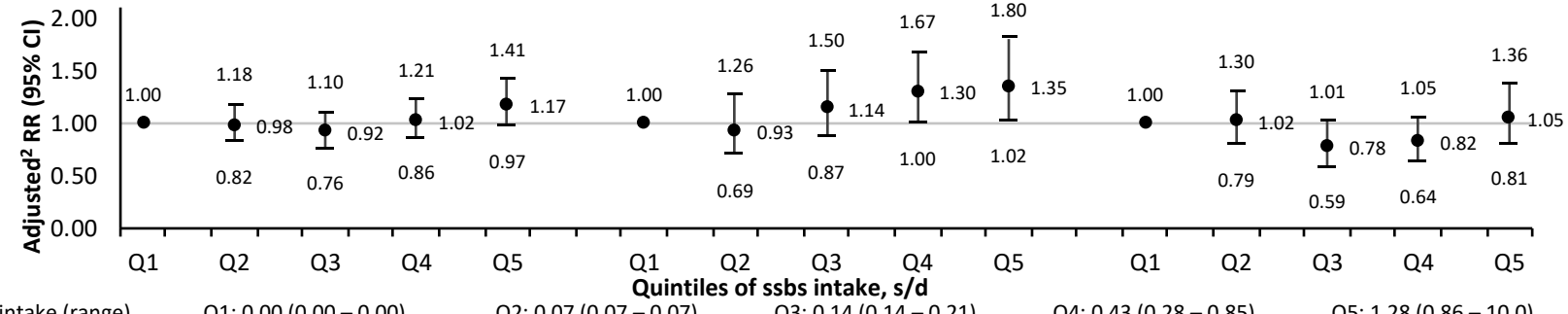
[2]Models were ran by log-binomial generalized regression models with exchangeable correlation matrix using generalized estimating equation to account for repeated pregnancies from the same woman and adjusted for age at pregnancy, physical activity, smoking status, year of pregnancy, infertility diagnosis, marital status, race, parity multivitamin use, history of gestational diabetes and preeclampsia at baseline.

Supplementary Figure 2. Association of pre-pregnancy intakes of individual AHA and DASH score components with the risk of all phenotypes of hypertensive disorders of pregnancy (HDPs). The Nurses' Health Study II (1991 – 2009). N= 11,535 women, 16,896 pregnancies.[1] **(CONTINUED)**

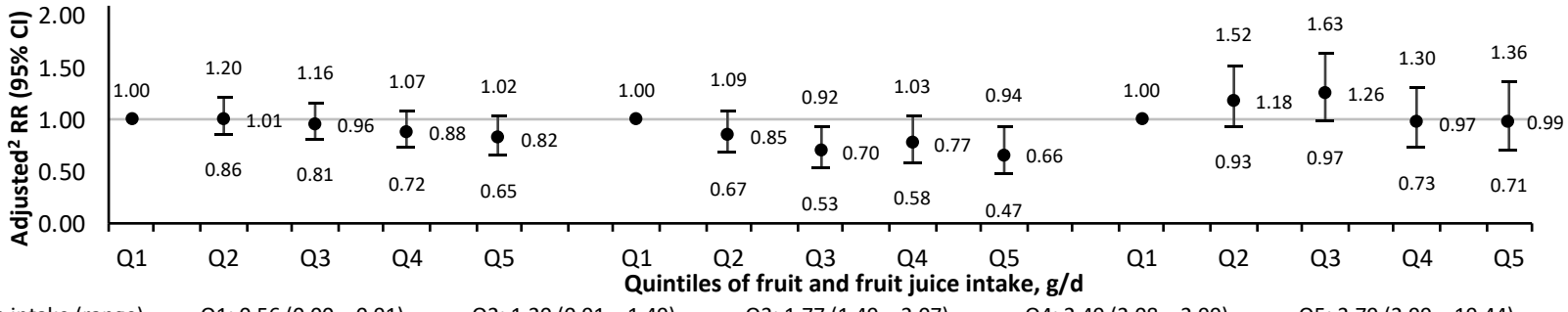
B. Co-adjusting for individual components of the DASH score



Median intake (range) Q1: 1.64 (0.52 – 1.80) Q2: 1.91 (1.81 – 2.00) Q3: 2.10 (2.01 – 2.18) Q4: 2.23 (2.19 – 2.38) Q5: 2.55 (2.39 – 5.08)



Median intake (range) Q1: 0.00 (0.00 – 0.00) Q2: 0.07 (0.07 – 0.07) Q3: 0.14 (0.14 – 0.21) Q4: 0.43 (0.28 – 0.85) Q5: 1.28 (0.86 – 10.0)



Median intake (range) Q1: 0.56 (0.00 – 0.91) Q2: 1.20 (0.91 – 1.49) Q3: 1.77 (1.49 – 2.07) Q4: 2.49 (2.08 – 2.99) Q5: 3.79 (2.99 – 19.44)

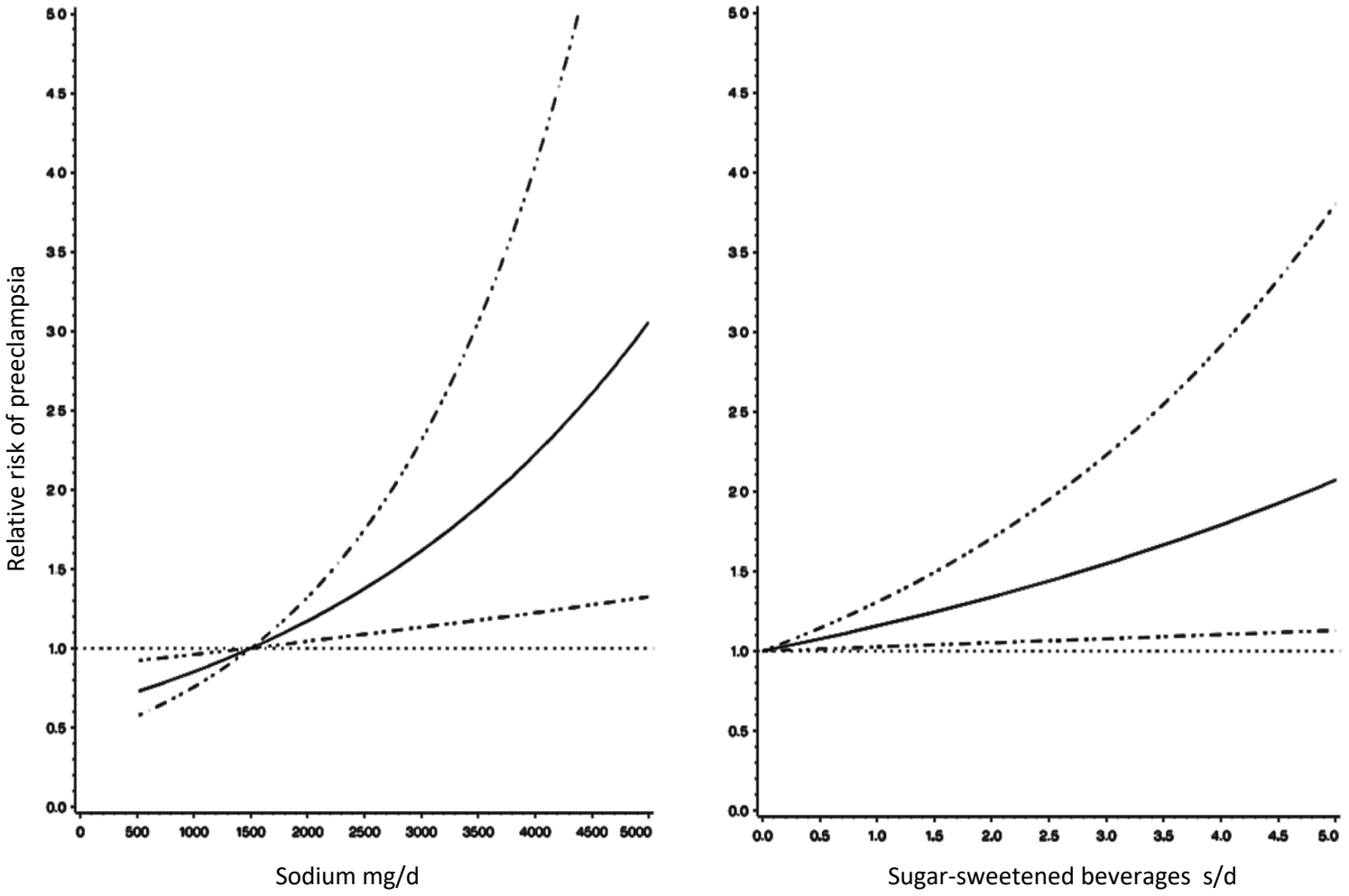
HDP (n=1,056) **Preeclampsia (n=495)** **GHTN (n=561)**

[1]Abbreviations: GHTN, gestational hypertension; RR (95%CI), relative risk 95% confidence intervals; Q1, lowest quintile of intake; Q5, highest quintile of intake; SSBs, sugar-sweetened beverages.

[2]Models were ran by log-binomial generalized regression models with exchangeable correlation matrix using generalized estimating equation to account for repeated pregnancies from the same woman and adjusted for age at pregnancy, physical activity, smoking status, year of pregnancy, infertility diagnosis, marital status, race, parity multivitamin use, history of gestational diabetes and preeclampsia at baseline.

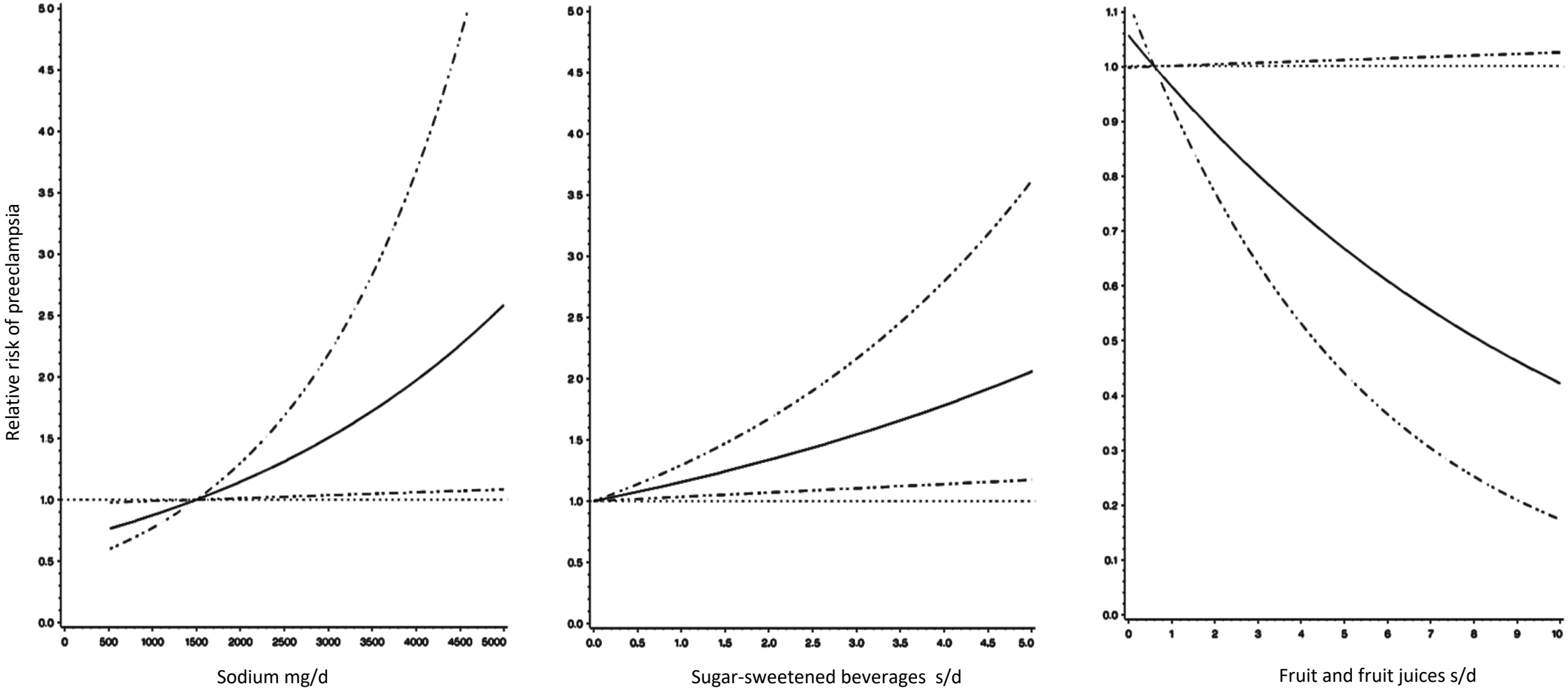
Supplementary Figure 3. Intakes from the individual components of the AHA and DASH dietary pattern scores and the risk of preeclampsia.[1]

A. Individual components co-adjusted for the AHA secondary score



Supplementary Figure 3 (cont). Intakes from the individual components of the AHA and DASH dietary pattern scores and the risk of preeclampsia.[1]

B. Individual components co-adjusted for the DASH score



[1]Abbreviations: AHA, American Heart Association diet recommendations; DASH, Dietary Approaches to Stop Hypertension; SSBs, sugar-sweetened beverages.

[2]Models were adjusted for adjusted for age at pregnancy, total energy intake, BMI, physical activity, smoking, year of pregnancy, infertility diagnosis, marital status, race, parity, multivitamin use, history of gestational diabetes and preeclampsia.

[3]The RR (95%CI) of preeclampsia was estimated non-parametrically with spline function polynomials by log-binomial regression models with generalized estimating equations.